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EXAMINER

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ART UNIT	PAPER NUMBER
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1626

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Please find below and/or attached an Office communication concerning this application or proceeding.

## DETAILED ACTION

Claims 1-3, 6-44 and 47-56 are pending in the application.

### *Continued Examination Under 37 CFR 1.114*

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 25, 2003 has been entered.

Rejections made in the previous Office Action which do not appear below have been overcome. Therefore, arguments pertaining to these rejections will not be addressed.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 6-44 and 47-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buysch et al. {U.S. Pat. 5,856,554}, Buysch et al. {U.S. Pat. 6,548,445} and Shalyaev et al. {U.S. Pat. 6,566,295}, each taken alone or in combination with each other or each in view of the teachings in Mizukami et al. {U.S. Pat. 5,380,907} or Pressman et al. {U.S. Pat. 6,114,564}.

***Determination of the scope and content of the prior art (MPEP §2141.01)***

The instant application claims a process for the production of diaryl carbonates (e.g., diphenyl carbonate) by the reaction of an aromatic hydroxy compound (e.g., phenol), with carbon monoxide and oxygen in the presence of a catalyst composition comprising a Group 8, 9 or 10

metal or compound thereof (e.g., a palladium source), at least one salt (e.g., sodium bromide or tetrabutylammonium bromide) and at least one metal co-catalyst (e.g., copper, titanium, cobalt, manganese, etc.) and where the reaction is commenced at a temperature sufficient to keep the aromatic hydroxy compound molten. Further, the reaction is performed under various other conditions, such as when the temperature or pressure is increased, when the CO (carbon monoxide) and O<sub>2</sub> (oxygen) is mixed, and when it is introduced, etc.

Each of the above cited prior art teaches a process for the preparing of diaryl carbonates.

Buysch et al. '554 teach a process for the production of diaryl carbonates {e.g., diphenyl carbonate -DPC} by the reaction of an aromatic hydroxy compound (e.g., phenol) with CO and O<sub>2</sub> in the presence of a catalyst composition comprising a platinum metal catalyst {which consists of at least one metal of Group VIII such as palladium}, a quaternary salt (e.g., tetrabutylammonium bromide) and a metal co-

catalyst {e.g., manganese (III) acetylacetonate}. See, for instance, Example 1 in columns 8-9. The temperature and pressure are within the scope of the instant claimed invention (column 3, lines 8-12). Further, Buysch et al. teach that it is advantageous to conduct the process under conditions where the starting hydroxy compound is in a melt with diaryl carbonate, (column 2, lines 42 through column 3, lines 16; and Examples 1-6).

Buysch et al. '445 teach a process for the production of diaryl carbonates by the reaction of an aromatic hydroxy compound (e.g., phenol) with CO and O<sub>2</sub> in the presence of a catalyst composition comprising a supported catalyst system containing palladium and manganese and a quaternary salt (e.g., tetrabutylammonium bromide). See, for instance, Example 1 in column 8. The temperature and pressure are within the scope of the instant claimed invention. Further, Buysch et al. '445 teach dissolving a base in a phenol melt which has been diluted with a solvent (column 7, lines 9-16).

Shalyaev et al. teach a process for the production of diaryl carbonates {e.g., diphenyl carbonate -DPC} by the reaction of an aromatic hydroxy compound (e.g., phenol) with CO and O<sub>2</sub> in the presence of palladium(II)acetylacetonate, a salt of an alkali metal (e.g., sodium bromide) and a metal co-catalyst {e.g., copper(II) acetylacetonate}. See, for instance, Example 1 in columns 9-10. Shalyaev et al. also teach Applicants' activating solvent (e.g., tetraglyme).

*Ascertainment of the difference between the prior art and the claims (MPEP §2141.02)*

The difference between the teachings in Buysch et al. '554, Buysch et al. '445 and Shalyaev et al. is the order in which reactants/reagents are combined.

*Finding of prima facie obviousness--rational and motivation (MPEP §2142-2413)*

It has been held that merely reversing the order of steps in a multi-step process is not a patentable modification absent unexpected or unobvious results. Ex parte Rubin, 128 USPQ 440 (1959).

Although, Mizuhami et al. teach that the inside system was replaced with carbon monoxide, then with a combination of carbon monoxide and oxygen (Example 1 in column 4).

Further, Mizukami et al., or alternatively, Pressman et al. '564 teach that the process is conducted in the presence of an activating compound (e.g., a solvent that is within the scope of that taught in the instant application). In Mizukami et al., the activating solvent is a nitrile compound (column 2, lines 43-44; and column 3, lines 6-17); and in Pressman et al. '564, the activating solvent is a polyether such as diethylene glycol dimethyl ether (column 4, lines 17-46).

One skilled in the art would have been motivated to utilize the processes taught by the prior art to arrive at the instant claimed process with the expectation of obtaining diaryl carbonates. One skilled in the art would also be motivated to combine the teachings of the prior art to arrive at the instant claimed process since the various catalyst compositions are well known in the art for the production of diaryl carbonates and to provide an optimized process. Thus, it would have

been obvious to one of ordinary skill in the art at the time the invention was made to combine the references and modify the prior art, given the state of the art at the time the invention was made, in order to optimize the process absent a showing of unexpected results. Therefore, the instant claimed invention would have been suggested to one skilled in the art.

### *Response to Arguments*

Applicants' arguments filed February 18, 2003 have been fully considered. Applicants argue that Buysch et al. '554 require that the reaction mixture at the start of the reaction have a content of diaryl carbonate. In response, Applicants' independent claim 1, for example, has "comprising", which is open-language. Therefore, having "at least 20 wt. % of diaryl carbonate in the reaction mixture at the start of the reaction" is embraced by the instant claims.

Applicants argue that the yields of the diaryl carbonate products of Buysch et al. are less than the yields of the instant claimed invention.



Applicants argue that a side-by-side comparison of the instant process with that of Buysch et al. '554 is not possible since the conditions in Buysch et al. '554 are not the same. In response, Applicants' argument has been considered but has not been found persuasive. Applicants have not demonstrated, in a side-by-side comparison, that the instant claimed process has unexpected, beneficial and superior results over the teachings of the cited prior art. Again, the only difference in, for instance, Example 1 of Buysch et al. '554 and, for example, instant claim 1 is the order in which reactants/reagents are added. Changing the order in which reactants/reagents are added is not patentable unless unexpected results are shown. Applicants would therefore have to demonstrate an unobvious, unexpected and beneficial showing of unexpected results over the prior art.

Applicants argue that Mizukami et al. do not teach Applicants' "salt" component. In response, it is agreed that Mizukami et al. do not teach the claims, as amended, salt component. However, Mizukami et

al. is a secondary reference to show other aspects of Applicants' invention which are known in the art.

Applicants argue that Pressman et al. '564. do not teach Applicants' addition of carbon monoxide then a mixture of carbon monoxide with oxygen. In response, it is agreed that Pressman et al '564 do not teach the addition of carbon monoxide then a mixture of carbon monoxide with oxygen. However, Pressman et al. '564 is a secondary reference to show other aspects of Applicants' invention which are known in the art.

Applicants argue that the temperature ranges in Buysch et al. '554 relate to the temperature ranges for reaction of an aromatic hydroxy compound with carbon monoxide and oxygen and do not relate to temperature ranges for heating a mixture at atmospheric pressure then pressurizing under carbon monoxide alone in the absence of oxygen. In response, Buysch et al. '554 teach a temperature range embraced by the claims, including instant claim 33. Buysch et al. '554 teach that the preferred temperature range is 40° to 120°C and a pressure of 1-200 bar (column 3, lines 8-11). As stated above, the order in which reactants are

added is different. Therefore, Buysch et al. '554 teach the overall reaction temperature and pressure ranges and not the specific temperature and pressure at each step as Applicants are claiming.

Applicants argue that combining the teachings of Buysch et al. '554, Mizukami et al. and Pressman et al. '564 does not teach or suggest the instant claimed invention. Specifically, Applicants argue that the combination of the references does not teach or suggest: (1) the start-up conditions under which a carbonylation catalyst system may become inactive or less active; and (2) that the reaction mixture is heated at atmospheric pressure to a specific temperature range then pressurized with carbon monoxide as in instant claims 33 and 34.

All of Applicants' arguments have been considered but have not been found persuasive. The instant application claims a process for the production of diaryl carbonates (e.g., diphenyl carbonate) by the reaction of an aromatic hydroxy compound (e.g., phenol), with carbon monoxide and oxygen in the presence of a catalyst composition comprising a Group 8, 9 or 10 metal or compound thereof (e.g., a palladium source), at least

one salt (e.g., sodium bromide or tetrabutylammonium bromide) and at least one metal co-catalyst (e.g., copper, titanium, cobalt, manganese, etc.).

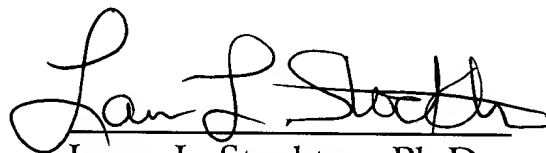
Each of the cited prior art teach a process of making diaryl carbonates by a similar process to that which is instantly claimed. Changing the order in which reactants/reagents are added is not patentable unless unexpected results are shown over the cited prior art. In regard to Applicants' argument concerning the specific temperature ranges, instant independent claims 1, 34, 37, 38, 42 and 56 do not state such temperature and pressure ranges. Instant independent claim 33 uses the language "about" in which, as shown in Example 1 of Buysch et al. '554, 60°C can be considered "about" 72°C. Instant independent claims 35 and 36 use the language "no higher than about 72°C".

For all the reasons given above, the instant claimed invention would have been suggested to one skilled in the art and therefore, the instant claimed invention would have been obvious to one skilled in the art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Laura L. Stockton whose telephone number is (703) 308-1875. The examiner can normally be reached on Monday-Friday from 6:00 am to 2:30 pm. If the examiner is out of the Office, the examiner's supervisor, Joseph McKane, can be reached on (703) 308-4537.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-1235.

The fax phone number for the organization where this application or proceeding is assigned is (703) 308-4556.

A handwritten signature in cursive script, appearing to read "Laura L. Stockton", written over a horizontal line.

Laura L. Stockton, Ph.D.

Patent Examiner

Art Unit 1626, Group 1620

Technology Center 1600

May 29, 2003